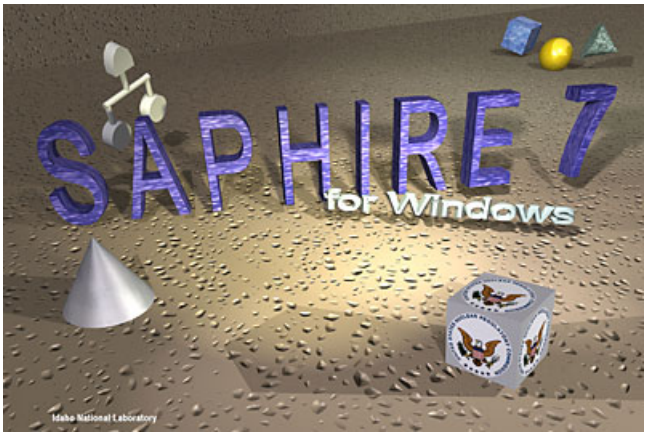


One of the most important safety tools Smith and his INL team use is an INL-developed computer program called SAPHIRE.

INL nuclear engineer is safe bet for risk information

by Brett Stone, *INL Nuclear Science and Technology communications intern*

Not many people understand safety better than Idaho National Laboratory's Curtis Smith.

Each time a space shuttle lands or someone plugs into electricity coming from one of America's 104 nuclear power plants, Smith deserves a bit of credit.

Smith holding a newspaper cover of NASA's New Horizons liftoff. INL provided the RTG battery which now powers the spacecraft on its mission to Pluto and beyond.

Smith, who has a doctorate in nuclear engineering, has worked for almost 20 years helping make some of the country's most visible and consequential programs run more safely and deliver more of what the nation wants and needs. As an INL risk and reliability engineer, Smith helps the nation's decision-makers look at safety in a whole new light.

Working for customers such as NASA and the Nuclear Regulatory Commission, Smith analyzes situations in ways most people never think of. "Risk-Informed Decision-Making" is the technical name for what Smith describes as, "understanding the risks associated with doing business."

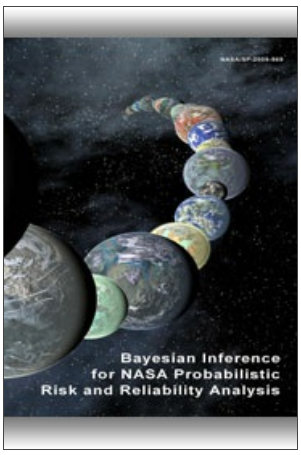
Smith's "business" has to do with many of the world's scientific and political hot-button issues.

"It's a risky endeavor to be an astronaut," said Smith, who has helped analyze two of NASA's biggest accidents, Challenger and Colombia. But, "trying to make that risk zero isn't realizable," he explains. With every action, an associated risk is assumed. Smith's job is to put those risks and the potential consequences into perspective for decision-makers.

One of the most important tools Smith and his INL team use is an INL-developed computer program called SAPHIRE. Smith and his colleagues can enter thousands of "basic events" or different parts and pieces that could fail in a given system. These could be pumps or valves in a nuclear plant, computers, or batteries on the space shuttle. Smith and his colleagues can then produce different possible scenarios where one or more of these parts fail.

Where government-sponsored computer programs are concerned, SAPHIRE has been highly successful. Now in use for more than 20 years, it's held in high regard around the world and has its eighth version in beta development. But, as with just about everything else, Smith and his colleagues keep a real-world perspective.

Besides constantly working to update the program, Smith also explains that when considering risks and benefits, some things are difficult to put into numbers. He cites examples such as politics or public opinion, which is why he emphasizes that his job is about helping make risk-informed decisions, not risk-based decisions.



"You have to balance them in a rational way," Smith said of comparing the risks and benefits of a decision.

So how safe are America's nuclear power plants? According to Smith, there are two things to consider:

First, look at the benefits. Consider not having to import oil from places like the Middle East and having a carbon-free source of electricity, he says. Second, what are the risks? Smith compares the number of deaths of workers involved in, for example, coal mining to the nuclear industry — that alone makes nuclear safer, he says. In other countries the difference is even more stark. "What do you get from the activity and how does it compare?" Smith asks.

Smith's expertise in risk analysis, along with his strong desire to learn and do more for public safety, have taken him places he might have never considered. Growing up on the Fort Hall Indian Reservation near Blackfoot, Idaho, Smith enjoyed most of his high school classes. But it wasn't until he attended Idaho State University that he found his real calling.

Read the Bayesian Inference for NASA Probablistic Risk and Reliability Analysis.

While enrolled in ISU's nuclear engineering program, Smith took a couple of risk and reliability analysis courses and, "found a place to actually help people and make the world better," he said. From there, his career has taken him to Boston where he earned his doctorate at Massachusetts Institute of Technology. It even took him — along with his wife and (now) four young children — to Norway where they lived for a year.

In Norway, Smith collaborated with scientists who studied human behavior and risk analysis on the front lines of nuclear security. Teams of nuclear power plant workers there are placed in a nuclear power plant simulator and presented with various challenging situations, such as fatigue and equipment failure. Smith shared his understanding of probability risk analysis and learned from the Norwegians' understanding of the human element.

Although his family enjoyed going to Red Sox games in Boston, and his two oldest children learned Norwegian while attending school in Norway, Smith and his family eventually returned to Idaho with his job. Besides saying that it is just a nice place to live, Smith says that INL is unique in some important ways. He says INL's position as one of the premier national laboratories has allowed him to apply his talents across different disciplines, which he has enjoyed.

And INL is happy to have him. "When Curtis talks, people tend to listen," said co-worker Ted Wood, who's known Smith for 15 years. Wood says that while Smith is not only instrumental in breaking down complex situations and analyzing them, "He's a real team player," who is willing to take suggestions and likes to give credit to other people.

For Smith, the real objective is not so much who gets the credit. It is achieving the same goals he has had since he took those engineering classes in college that helped him discover how he could help make important changes in the world.

"Being able to make a real difference," he says, "knowing that I'm helping make the world a safer place, helping to teach people … it is pretty rewarding."

See a list of Smith's recent technical publications.

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